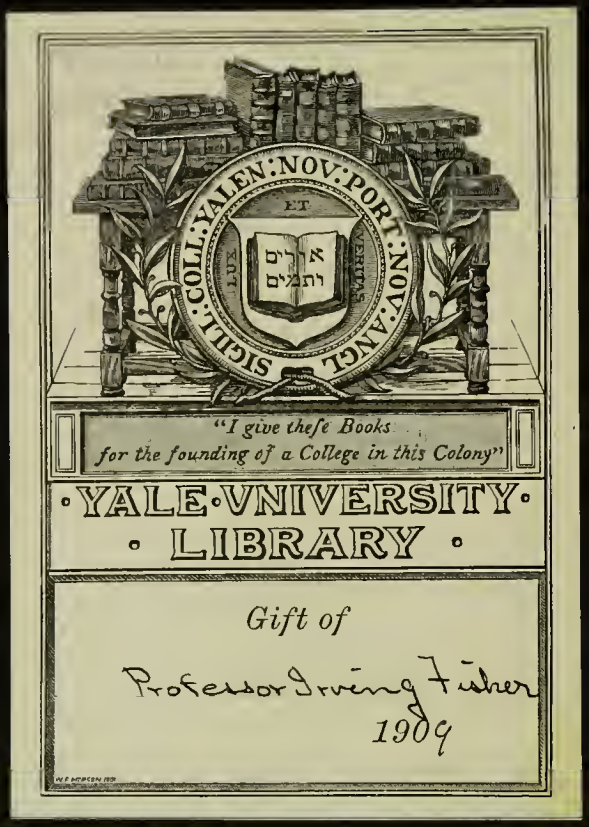
Practical Infant feeding

Feeding Formulas.

Joseph E. Winters.



PRACTICAL INFANT FEEDING

FEEDING FORMULAS

BY JOSEPH E. WINTERS, M.D.,
NEW YORK
Professor of the Diseases of Children, Cornell University Medical College (in New York)

¶ In the last quarter of a century the mortality of children has continued almost constant, while the mortality of older persons has decreased nearly one-half. The thwarting of nature proceeds from lack of dissemination of knowledge of the physiological necessities of a growing infant, and of the meagre nutritive value of the superfluous foods. Feeding is founded on physiology—nature's unalterable, infallible laws.

Read before the Brooklyn Pediatric Society, at its Annual Meeting; before the Medical Society of the County of Kings, and before the Medical Society of the County of New York.

CORRELATION OF PHYSIOLOGY AND INFANT FEEDING

Nature's precepts as to the food for an infant are so explicit that they stand as express commandments.

In the tenement, in the institution,* in the hovel, and the mud hut, mortality of *exclusively* breast-fed children is no higher than in the most salubrious residence. A breast-fed child is seldom ill, rarely coming under a physician's care. This finished, faultless, perfect, consummate food contains, by latest analysis,† 5.01 per cent. fat, 6.98 per cent. milk-sugar, 1.29 per cent. proteid.

The same authority states, "The fat content constantly and uniformly increases during the process of nursing" (Engel).

The nursling extracts for his behoof a complement of fat *unascertainable* by analysis.

In a breast-fed child nutrition, development, vigor, rosiness, animation, are proportionate to the fat.

A mother of eighteen had a child of unusual development and vigor. Her breast milk contained 5.84 per cent. fat. A wet-nurse of nineteen with a nursling of remarkable growth had 5.76 per cent. fat.

The strippings are 1.50 to 2 per cent. higher in fat than the fore-milk.

A breast-fed child whose nutrition and development would be considered perfect, probably receives from 6 to 7.50 per cent. fat.

Parallelism of Woman's Milk and Infant Physiology

That the ample fat in a *superior* quality of woman's milk, must suffer no curtailment when substituting, is attested and subscribed to by the physiology of an infant.

In an infant, centres for heat and respiration are imperfectly developed; nervous energy is at low ebb; power of compensation slight.

---

* Szalardi says that during his twelve years' incumbency in the Budapest Foundling Hospital the mortality never exceeded *five* per cent., and adds, "For these results I have to thank the custom of admitting the mother with the child, which was observed with but very few exceptions."

† Dr. S. Engel in Pfaundler and Schlossmann, Vol. I., p. 345.

Fat is *paramount* as a source of heat. Heat (co-relative of force) is converted into force and energy for every action and function of the organism. To sustain heat, respiration, and nervous energy in a new-born child, fat must be present in large amount.

77½ per cent. of heat lost to the body is from cutaneous surface. The surface of a child is *relatively* three times as great as that of an adult. The larger the cutaneous surface *relative* to the size of the body, the greater is the amount of heat lost by radiation and evaporation. Expenditure of heat is 130 calories per kilogram of body-weight in an infant of five months; 91 calories in a child of a year and a half; 35 calories in an adult. This large and rapid heat loss makes an ample supply of the pre-eminent body fuel, fat, a physiological necessity.

That the 6 per cent. or more of fat in woman's milk is prerequisite, *preordained*, and physiological, is expressly *declared* by the presence in the brain of eight per cent. fat, in the nerves twenty-two per cent., both of which are developing with great rapidity; in the marrow of bone, *where the red blood-cells are chiefly formed*, ninety-six per cent. fat.

These tissues are all increasing in weight and functional activity with marvelous rapidity. The brain doubles its weight in the first two years of life. In these structures an infant is *laying down* a large amount of tissue rich in fat—fat for every nerve and brain cell, and for the marrow cells.

Control Observations

Fat Incommensurate with Physiological Standard Exemplified

When mother's milk, or an artificial food, is seriously defective in fat, there are identical stamps of profound innutrition, *i.e.*, depressed fontanelle, sunken intercostal spaces, anæmia, inanimation.

The pallid, wan, inanimate baby, is striking betrayal of famished bone-marrow, and nerve.

The fat stored during intrauterine formation* has been totally oxidized to sustain heat, respiration, and nervous energy.

Restore breast milk ample in fat, or an exact counterpart in an artificial food, and plumpness, firmness, rosiness, animation, joy of babyhood, supersede pallor and apathy.

Foods deficient in fat for nutrition of brain cells and of marrow cells, are answerable for the mournful little old men and women, who never smile.

That fat is vital in the nutrition of young growing animals, is evident from its large proportion in the milk of all animals.

---

* In the eight months' fœtus, fat is 2.44 per cent. of the total constituents; in the nine months' fœtus *8.7 per cent.* Nearly one-half of the dry residue of the body of an infant at birth is fat. The relatively great fat requirement of an infant is vital by virtue of the peculiarity of an infant's body.

Fat Indigestion

Separator cream superinduced this: The centrifuge makes 6,700 revolutions per minute. Contrast this with cream of Nature's formation: Fat rises slowly to surface and forms a layer known as cream. Each fat globule, by molecular attraction, is surrounded by a stratum of proteid, this prevents them from uniting with each other. Centrifugalization destroys normal, cohesive attraction of fat globule and proteid; proteid is wanting, fat globules become coherent. Conglomerate fat has difficulty in making the passage of the narrow infant pylorus, and is delayed in reaching secretions for fat digestion. Conglomerate fat is as indigestible as cheese. Centrifugal cream is proteid-free, therefore mineral-free—destitute of growth constituents; vigor and vitality dwindle and die out. *Gravity cream contains all the constituents of milk—3 per cent. proteid.*

Another cause for fat indigestion is the milk of Jersey and Guernsey cows. Separator cream and the milk of these breeds must not be used for feeding an infant.

Gravity cream from cows of average grade, properly modified, is perfectly digestible by the youngest, and most delicate infant.

Proteid

Woman's, and cow's milk, contain two proteids, albumin and casein.

Albumin is not coagulated in the stomach. Casein is coagulated into tough, leathery masses.

Albumin forms two-thirds of the proteid of woman's, casein four-fifths of the proteid of cow's milk.

WOMAN'S MILK

	Per cent.
Albumin	1.23
Casein	0.59
Proteid	1.82

COW'S MILK

	Per cent.
Albumin	0.53
Casein	2.88
Proteid	3.41

Casein is *one-third* of the *low* total proteid of woman's, *four-fifths* of the *high* total proteid of cow's milk!

The infant pylorus is so narrow that it allows only the passage of a small probe, and is surrounded by a protuberant, firm, muscular ring.

The non-coagulated, non-coagulable albumin of woman's milk readily

makes the passage of the narrow pylorus to the intestine, where absorption is immediate. Casein masses of cow's milk cannot make the passage of the pylorus. *Physical behavior of proteid which enables it to make the passage of the pylorus is fundamental to success.*

Contrast Presented by the Physical Behavior of Proteid in Skimmed Milk and Top Cream

Skimmed milk from good bottled milk, sixteen hours after milking. Total proteid, 3.89 per cent.; casein, 2.99 per cent. Skimmed milk when diluted with water and lime water as for feeding, and acidulated at feeding temperature, yields a *few large tough curds, which on stirring, stick together and sink.* Top cream, top ½ ounce from each of four quart bottles of milk, giving a composite sample, sixteen hours after milking. Total proteid, 3 per cent.; casein, 2.13 per cent. This cream, when diluted with water and lime water as for feeding, and acidulated at feeding temperature, yields an *immense number of finely divided, light, feathery flocks, which float in the solution, and are easily reduced to a semi-emulsified condition by stirring.**

Physical Behavior of Proteid in Different Cream Layers

Upper 8 ounces.—From one quart bottle sixteen hours after milking. This cream, when diluted with water and lime water as for feeding, and acidulated at about 98° to 100° F., gave a coarsely flocculent floating curd, which can be broken up by stirring, but only with some difficulty, and *quickly collects into large masses again.*

Upper 4 ounces.—This cream, when treated in the same manner as above, gave a finer curd, which was more easily broken up by stirring.

Upper 2 ounces.—This gave a finer curd than either of the above, when treated under the same conditions.

Upper 1 ounce.—There was no appreciable difference between the upper ounce and the upper 2 ounces. While a difference doubtless existed, it was not sufficiently pronounced to be observable.

Upper ½ ounce.—Yields *an immense number of finely divided, light, feathery flocks, which float in the solution, and are easily reduced to a semi-emulsified condition by stirring.* In other words, food prepared from the top ½ ounce of cream presents the same physical behavior as woman's milk, and readily makes the passage of the narrow pylorus.

Utilization of proteid by a young infant is contingent upon its physical behavior.

---

* Analyses and coagulation experiments made by Mr. Henry C. Sherman, Ph.D. (Cornell), at Havemeyer Hall, Columbia University.

Proteid, with Its Contained Minerals, Is the Growth-Constituent

There is a definite and unfailing relationship between growth and the percentage of proteid in milk. The calf doubles its weight in forty-seven days with 4 per cent. of proteid in milk; the lamb in ten days with 7 per cent.; the puppy in eight days with 8.28 per cent.; the kitten in five days with 9.33 per cent.

A child increases in *length* most rapidly the *first* week of life. *Bounteousness of growth-constituent is vital.*

The *first* and *second* days after childbirth, the secretion of the breasts contains 8.6 per cent. *albumin*—immediate nursing saves many lives; from the third to the seventh day, 3.4 per cent.; from the eighth to the fourteenth day, 2.5 per cent.

Mortality of infants under one year is so great that an equally high death rate is not again recorded until the age of eighty years!

Seventy-five per cent. of deaths in first year, occur in first half; of these a large proportion die in *first* month. Mortality is highest in *first* week, falls enormously in second week, remains nearly stationary through third, and shows another marked decline in fourth week. Mortality in *second* month is only a *small fraction* of that in *first* month.

Ample heat- and growth-constituents in first weeks would efface the mortality column of artificial feeding.

High proteid, non-coagulable, absorbable without digestive effort is impossible of duplication.

For extrication from a discrediting mortality peak, unparallelable secretion of first weeks must be utilized.

Calcium phosphate, magnesia, sodium and potassium chloride, in greater quantity in colostrum than in milk of later period, is detergent, cleansing of *perilous* meconium.

With maternal nursing, mortality is lower than with wet-nursing, attributable to matchless qualities of colostrum.* Colostrum contains no casein.

Change from colostrum to milk takes place during third week. Readily absorbable proteid decreases, less easily absorbable, augments. This proteid calls forth considerable digestive effort.

The stomach of an infant increases rapidly in size during *first two months* of life, slowly in next two months, it is then comparatively quiescent until after sixth month.

Capacity of Stomach

Birth	1 ounce
One month	2½ ounces
Two months	3½ ounces

* During the siege of Paris, while the general mortality was doubled, that of infants was lowered 40 per cent. owing to mothers being driven to suckle their infants!

At end of second month an infant's stomach is not only a more perfect receptacle for food, but its fundus, its contractile and propulsive power, the *pylorus*, and all its functions, have correspondingly developed. With increase in size and function of stomach, a child becomes adapted to digestion of food other than breast milk. After *six* weeks, a child can readily digest properly modified cow's milk.

Indispensableness to Mother of a Limited Period of Lactation

Before impregnation the uterus measures $2\frac{3}{4}$ inches in length, $1\frac{3}{4}$ in breadth, less than an inch in thickness; its weight is from an ounce to an ounce and a half.

At end of pregnancy it measures 14 inches in length, 10 in breadth, $9\frac{1}{2}$ in thickness, and weighs 2 to $2\frac{1}{2}$ pounds. The organ has increased in size twenty-five times.

After delivery it should diminish in weight one pound in two weeks. It should be restored to its normal size in *six* weeks. Restoration is brought about by uterine contraction.

Uterine contraction, by obliterating vascular canals, causes fatty degeneration and absorption of superabundant tissue. If contractions are not *powerful*, blood channels are not obliterated: Each time the infant seizes the nipple, the uterus contracts *powerfully*—it is perceptible to hand applied to abdomen, feeling as hard as wood. This reflex stimulation is applied ten times every twenty-four hours. It is maintained each time one-third of an hour.

A mother who does not nurse the *precautionary six* weeks has incomplete resolution. Imperfect restoration is the predominant cause of pelvic disease.

The important process of generation is half consummated with gestation and delivery. A limited period of lactation is necessary security.

Ability to Nurse

Of women delivered in School of Midwifery, Stuttgart, only 23 per cent. were able to nurse their infants. (1882, Herdegren.) 1904, Martin, *nearly 100 per cent. were able to nurse.* The report adds, the number increased only because it is insisted upon that *every woman able to nurse must actually do so.* The report concludes, "Obstetricians do not lay sufficient stress on mothers nursing; or they even advise against it without having valid reason to offer" (Pfaundler and Schlossmann).

As soon as a mother has received proper attention, place the child at her breast. Immediate nursing saves many lives. A child *must* nurse every

three hours the *first* day, every *two* the *second*—ten times in twenty-four hours.

Never give water from a bottle to a new-born child—refusal to nurse is certain to ensue.

Water may be given from a spoon *twice* the first day; it *must not* be given the *second.* Much water, even from a spoon, prevents vigorous nursing; vigorous nursing stimulates secretion.

Refusal to nurse, and non-secretion, are inevitable evil consequences of water. Needless weaning has become well-nigh universal through misuse of water. An infant has discomfort from one cause or another, often from superficial soreness and tenderness, consequent upon having been forced through a narrow bony outlet, or from the necessary handling by accoucheur. This is misinterpreted colic, and hot water given. It next cries from hunger, but refuses to nurse. Nursing is laborious and fatiguing. As long as a child can get anything, water or food, from bottle or spoon, it will not nurse. A muscular cushion exists in the cheek for drawing the breast. This is a large, well-developed muscle at birth. A child nurses for a few moments and becomes fatigued; it stops to rest exhausted muscles and falls asleep, or closes its eyes to exclude light, and this is mistaken for sleep. It is removed from the breast. Soon it is restless from hunger, but "colic" is suspected, hot water dispensed, again the breast is refused. Leave a child at the breast until satisfied, even if it falls asleep several times. When satisfied, it drops the nipple and the head falls away from the breast.

Because a child does not nurse eagerly and by rule, it should not be concluded that it has "colic" and the milk disagrees. *The milk of every healthy mother agrees with her child.*

Censurable Weaning

A new-born child has frequent green stools; heedless of the momentous fact that the abundant salts of first secretion are for purifying of infectious meconium, it is incorrectly inferred that the milk disagrees, and child is weaned. Retained meconium superinduces fatal infection. For nature's antidote a drug is substituted—calomel, castor oil, etc.

Indiscreet Remarks a Source of Causeless Weaning

Officiousness concerning baby may excite groundless apprehension, and limit secretion of breasts. Inconsiderate comments on deviations of *no moment*, curds, green stools, "mucus," "colic," sleeplessness, vomiting, lack of gain, deficient milk supply, too rich milk, too thin milk, and similar remarks create great alarm in a young and inexperienced mother, and have sacrificed many lives. Mention to a mother of one of these is *never* to be allowed.

That a new-born babe may be made to nurse by rule for a definite number of minutes is unworthy of consideration by those responsible for its life.

To weigh a child, place it at the breast five minutes or ten minutes, remove it while nursing greedily, and by again weighing, decide that it had nursed two ounces or three ounces, and when it cries from hunger, and cannot sleep, that the milk disagrees, and child must be weaned, is incredible, yet not infrequently practised.

Under such regimen a child was failing alarmingly. Permitted to nurse until sated, it gained thirteen ounces the first week, twelve the next, and fourteen ounces the third week. With nursing abridged to two minutes (!) a child had scarcely slept for days and nights. After nursing until it would take no more (three-quarters of an hour in my presence), it slept uninterruptedly from 8.40 P.M. until 5 A.M.

With watch in hand, nursing was abbreviated to one and one-half minutes (! !).

More than one-half the birth-weight had been oxidized to sustain heat and respiration! Curtailment suspended, gain was immediate and permanent.

Nursing by clock and scale is an insufferable absurdity.

During uterine regeneration a mother should be in a state of mental repose, and comparative seclusion; free from care, anxiety, and excitement. *No visitors, no discussion about her child:* Conditions essential to normal, healthful lactation.

Place the child in a darkened room apart, where there is absolute quiet, that it may sleep uninterruptedly except when taken to mother for nursing, after which replace immediately in its bassinet. It should not be handled, fondled or talked to. Nature's demands only should be attended to.

Unfailing observance of these simple elementary laws enables every mother to nurse for the indispensable weeks.

How Long is Mother's Milk a Perfect Food?

Composition and physiological necessities for growth are competent criteria. Proteid diminishes with advancing lactation. At end of colostrum period there is marked decrease. It then lessens gradually until end of second month. *After second month diminution is decided and rapid.*

In a child exclusively breast-fed, *maximum gain is during second month.* Proteid and minerals are inadequate for growth after second month. Nature did not purpose prolongation of lactation eight to ten months. Inequitable protraction is responsible for mothers refusing to nurse for the indispensable weeks.

For six weeks mother and child are mutually dependent, and bestow reciprocal benefit. Continuation of interdependence for six weeks would reduce infant mortality to normal. Disease incident to generation would disappear.

Artificial Feeding

The third week of lactation, albumin decreases, casein increases. *Irremediable* difference between woman's and cow's milk is gradually eliminated. With increase in size of pylorus, of contractile and propulsive power of stomach, a child becomes adapted to digestion of properly modified cow's milk.

Every breast-fed child should have one bottle from third week; two bottles after first month. This allows mother needed uninterrupted rest at night; desirable freedom in the day, accustoms digestion to an artificial food, makes weaning easy at any period. Neglect of this precaution renders weaning perplexing and distressful.

From one cause or another there are cases in which there is no alternative but artificial feeding from birth. The problem of a substitute for human milk for the *new-born* has constantly to be faced.

A *superior* quality of woman's milk must be the *standard* for a substitute. To deduce as *standard* the *average* of one hundred analyses, from 1.30 to 7.61 per cent. fat, is fallacious. Unquestionably a physician would select the *best*, not an *average*, or medium, wet-nurse; undoubtedly a facsimile of her milk is the only unimpeachable substitute. The deduction that the average of one hundred analyses, good and poor, is the type-food, is unscientific and untenable.

Gravity cream has a relatively low percentage of casein, a high percentage of fat. A duplicate of woman's milk is readily prepared from it.

Eternal, Inviolable Basic Principles

ABUNDANT FAT. FLOCCULENT, FEATHERY PROTEID

For correct percentages of casein and fat for *first weeks;* for *physical behavior proportional to narrow pylorus*, milk must be sixteen hours old, and only top half-ounce of cream removed.

The subjoined table shows the percentages of proteid and fat in different cream layers, and the ratio of proteid to fat.

Fat and Proteid as Found in a Series of Analyses

Portion Taken.	Fat.	Proteid.	Ratio.
Upper ½ ounce	24.8	3.1	8 : 1
Upper 1 ounce	23.1	3.2	7.2 : 1
Upper 2 ounces	21.4	3.3	6.5 : 1
Upper 4 ounces	20.1	3.4	5.9 : 1
Upper 6 ounces	18.6	3.5	5.3 : 1
Upper 8 ounces	16.7	3.6	4.6 : 1
Upper 12 ounces	12.1	3.7	3.3 . 1
Upper 16 ounces	9.4	3.8	2.5 : 1

Definite knowledge of the ratio of proteid to fat in different cream layers is essential for feeding a young infant, when casein must be low, fat high. In upper ½ ounce, 1 to 8; upper 8 ounces, 1 to 4½.

A young infant cannot be successfully fed on modification of upper eight ounces—*excess of casein, or deficiency of fat*, is unavoidable, *physical behavior insurmountable.* Here has been a universal pitfall.

Utilizable growth-constituent for a young infant is in *top half-ounce* of *gravity cream only.*

Pasteurization of Milk

In every tissue of the body, minerals and proteid are in organic union. Dissolve this union, the tissue is dead.

Proteid is the vital constituent of every cell. Cell nuclei are rich in iron, magnesia, phosphorus, lime, potash, soda. No formation of cells for fresh growth can occur unless these minerals are in organic union with proteid.

Minerals to be *assimilated* must be in organic union with proteid.

Animals for whom milk is a sufficient food, die of inanition when the minerals are extracted. The result is the same with the minerals restored to the proteid, fat, and milk sugar, *the organic union being broken up.* Organic union of mineral and proteid in milk is light and easily dissolved. Heat dissolves this union. Pasteurization dissolves or loosens this union. Milk in which the organic union of mineral and proteid has been dissolved will not sustain life; milk in which this union is partially dissolved, half sustains life. *Cells in every part of the body are half-living, half dead.* This is the primary and fundamental cause of the excessive death-rate in children. Susceptibility to disease, lost recuperability, are attributable to the need of minerals and proteid in organic union, for formation of cells, for renovation of tissue.

Pasteurized milk induces susceptibility, impairs resistance, increases death-rate. A rosy, plump, lusty child was never seen where pasteurized milk had been the *only* food for a *prolonged* period.

That contaminated, germ-infected milk can be rendered clean, pure, suitable, safe food for infants is unworthy of consideration. Pasteurization does not render dirty milk clean, stale milk fresh, nor germs harmless.

Pasteurization is a recourse to palm upon a credulous public milk unfit for food.

Physiological chemistry—immutable and fixed as the rising of the sun—interdicts pasteurized milk. Experimentation concurs. Experience demonstrates pasteurized milk iniquitous.

Pasteurized milk was practically universal in tenement babies summer, 1908. June 1st to July 18th, mortality from diarrhea in infants under one year was 47 per cent. higher than corresponding period 1907.

In thirteen summer weeks, from all causes, the deaths in infants under one year were 5,662—cells half-living, half-dead, invite disaster. The

zealot of pasteurization is as arbitrary to the law of nature, *i.e.*, the law of the Creator, as the anarchist to the law of government.*

Infant Foods

An infant is not endowed with ability to digest vegetable. With amazing disregard of this physiological fact, these foods, regardless of name, are entirely vegetable—from barley or other grain. Corn meal, oat meal, hominy, and potato would be no more incongruous.

Granting assimilability of proprietary foods, concedes incorrectness of physiology. Experimentation confutes this, validates, verifies physiology. Of one thousand children fed on various infant foods, 780 *more* die in first year, than of one thousand breast-fed children. Of those who survive, nearly all will be in bad health at end of year. Majority of these die later. Decisive, irrefragable attestation of the correctness of physiology; incontrovertible proof of the worthlessness of every proprietary food for a young infant.

Of those who survive, it is the milk in the mixture which nourishes, not the proprietary preparation.

Rare exceptions of supported nutrition are of those rarely endowed to assimilate an unnatural and abnormal quantity of *milk*, *impaired by these accessions*.

Infant physiology, physiological chemistry, experimentation, establish that the giving of any food other than modified raw milk to an infant under six months, is perfidious.

In Germany, when an infant under one year dies, the law requires the mode of feeding to be stated on the certificate of death.

In Berlin, mortality of artificially nourished infants is twenty times as great as that of breast-fed infants. In Munich, mortality of breast-fed babies amounted to 11 per cent., of bottle babies 89 per cent.

The disparity between natural and artificial feeding, arises from not conforming unto the order of nature. Woman's milk is the type-food. The substitute must contain the same constituents, *in the same proportions*, as in a *superior* quality of this prototype; when acidulated, at feeding temperature, it must present the same physical behavior; organic integrity of mineral and proteid must be unimpaired; it must contain *nothing not* contained in this perfect model. Barley, dextrinized cereal, malt soup, all adventitious and foreign accessions to modified milk, *enhance mortality*. The towering mortality column of artificial feeding is erected by these; impairment of milk by proprietary preparations; pasteurization, and such alien, incongruous and extraneous foods, as fat-free milk and buttermilk.

When the order of nature changes; when the functions of heat, respira-

* Economy to the poor of pasteurized milk: Five six-ounce tubes sell for 5 cents. An eight-cent quart bottle of milk will make *at least* three quarts of the diluted mixture in these tubes—or more than 15 cents per quart for whole milk. There is no rental; no delivery. Pasteurized milk is neither charity nor philanthropy.

tion, and nervous energy in the new-born, can be accomplished without fat as a source of heat; when the blood-forming, heat- and force-producing structures contain no fat; when women's breasts secrete barley gruel, dextrinized cereal, malt soup, wheat flour, sour milk, and fat-free milk, these anomalous, and strange feeding whims will be founded on some bottom of reason.

Construction of the Formulas

The fixed, unalterable purpose of perfect nutrition in bottle-fed infants elicited the formulas—compelled them; *there is no alternative.*

Dictated by those for whom they are written, they are true to their needs, true to nature. Conformation to science is exact, complete, perfect. Feeding formulas must be comprehensive, yet specific; flexible with the physician, inflexible with the nurse.

Physician May Individualize; Nurse Must Literalize

Sporadic cases may require variation of formulas by a physician, yet these are exceptional.

Deviation by Mother or Nurse Always Pernicious, Often Fatal

A trained baby-nurse was given charge of a three-month-old child, presenting the appearance, activity, and animation of a breast-fed baby. Shortly food was being taken in diminishing quantities, vigor and animation departed, pallor supervened. A trained nurse was substituted. With the same formula we had the happiness of seeing the former state restored. The nurse told the trained nurse, salt was added to the formula, and said, "We always put salt in the food in the hospital"!

A nurse prepared food by prescribed formula, at feeding time poured off some of the cream. Innutrition supervened. Intermeddling thwarted, nutrition was restored.

A new-born baby was not doing well. Investigation disclosed that the top ounce of cream was taken from one quart bottle. With *top half-ounce from each of two quart bottles*, derangement of digestion disappeared.

Food prepared by mother, indigestion the rule, rather than the exception. Making an unexpected visit at 2 P.M., to witness preparation of food, mother was out! Information was educed that food was prepared as early as 10 A.M., as late as 6 P.M.—any time when engagements would not be interrupted by such a commonplace as baby's food! A trained nurse instructed the child's nurse in the art of preparing food. In twenty-four hours nothing remained of the disturbance from indifferent management. The mother in a letter from the country when the child was eleven months wrote: "Our baby is so fine I wish you could see him."

A baby was not thriving. A keel-shaped half-ounce dipper replaced ounce dipper of different shape. Amendment was immediate—physical behavior of proteid precluded assimilation.

A child of eleven months had always had perfect digestion. Mother prepared food. Obliged to go to town, a nurse of two weeks (hospital trained) was instructed in preparation of food—which she had repeatedly witnessed. That night the child had severe vomiting and diarrhea: Castor oil, water for thirty-six hours, child was well. Barley gruel prepared by mother was now given. One week later, on a Sunday morning, mother left nurse to prepare gruel. After first bottle there was vomiting. Mother tasted gruel and found it excessively salty. Prepared fresh bottle, which agreed perfectly.

Good food is constantly adjudged faulty when fault is in preparation. One unsuitable food after another is often substituted, sometimes with fatal consequences. Faithfulness in preparation would have averted disaster.

A mother wrote, "Sunday night baby had sour stomach, and lime water has been added since." Answer: "Instructions mailed to you directed four ounces of lime water in formula. Please make these your literal guide. Further instructions will not be sent if you vary from them—disturbance of digestion or not thriving will be considered proof of this." Two years of uniformly good digestion have intervened. A magnificent boy the eventuality.

A mother substituted 8 ounces whole milk from one quart bottle, and top 8 ounces from another, instead of upper 8 ounces from each of two quart bottles. Vomiting, diarrhea, and high fever resulted.

Proneness to Intermeddle Unconquerable, Insuperable

A nurse whose various charges were in uniform health when modified milk was all she could avail herself of, were uniformly in *ill*-health when she was allowed to do the modifying.

A mother repeatedly attempted to induce a trustworthy nurse (instructed by a competent trained nurse in preparation of food) to deviate from prescribed formula. Her child was well and thriving. Had her orders been executed her child would have been ill.

There is an invincible temperamental unfitness which disqualifies unconditionally for the safe feeding of an infant. Semblance of insurmountable vomiting in numerous cases has subsided instantly, with a skilled trained nurse in charge—no change in formula.

Adequately commensurate concept of disease, superinduced by unfaithfulness to formulas, dismays and disheartens. Solicitude for a good and great cause inspires renewed endeavor. Inculcate convincingly, until conviction is instilled, that any modification of a formula may initiate fatal disease.

The feeding of an infant is an exact science, founded on infant physi-

ology, physiological chemistry, and physical behavior of milk. This science is above and beyond the ken of any nurse. One devoid of a knowledge of this science is in darkest Egypt when directing the feeding of an infant. Notwithstanding the complexity of this science, feeding-charts emanating from promoters of patent (vegetable) foods are suffered to direct the welfare of a precious child!

A nurse who never swerved from instructions, fed three consecutive children in one family. The mother said, "Your babies are exactly like breast-fed babies."

The formulas administered with fidelity, afford results identical with breast-feeding—the self-same marks, *i.e.*, in coloring, animation, activity, rotundity, firmness, immunity from food disorders. Literal adherence to formulas is paramount. Co-operation of mother and nurse is requisite for successful feeding.

Alleged biological and other inscrutable differences between woman's and cow's milk are the unmitigated hypotheses of those whose feeding attempts are failures. With a two months' stomach, and two months of lactation, there is no irremediable or insurmountable difference between woman's and cow's milk. Apology of expediency of cereal for splitting curd is naked confession of failure, and of inaptness for feeding.

Accoucheur is conceded charge of child when he is subject to a thousand hazards. This is an egregious and costly blunder. In this one month, digestion, nutrition, and vigor, may be impaired beyond repair. Death may be an inevasible sequela years later—certainly six or eight. Cesarean section by pediatrist would be no more preposterous than feeding by obstetrician!

It is earnestly requested that every word of the text be carefully weighed before consulting or using these formulas.

FEEDING FORMULAS

Home Modification of Milk

Formula No. 1

First, Second, and Third Days:

Upper ½ ounce from each of two quart bottles of milk.*
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 4 ounces.
Lime water, 1 ounce.
Ten bottles. Feed every two hours.

---

* The milk must have been put in the regulation quart glass milk jars of commerce immediately after milking, and must have been kept standing upright in the refrigerator at least sixteen hours from the time of milking. In metropolitan centres the quart bottles of milk must have been kept standing upright on ice at least six hours after they are received in the nursery before removing the top ½ ounce of cream. The top

Formula No. 2

FOURTH, FIFTH, SIXTH, AND SEVENTH DAYS:

Upper ½ ounce from each of three quart bottles of milk.
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 6½ ounces.
Lime water, 2 ounces.
Ten bottles of one ounce. Feed every two hours.

Formula No. 3

SECOND WEEK:

Upper 1 ounce from each of three quart bottles of milk
(Use 2½ of the 3 ounces in preparing food.)
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 10 ounces.
Lime water, 2½ ounces.
Ten bottles of 1½ ounces. Feed every two hours.

Many do not take entire quantity; do not urge. One, and sometimes two, bottles may be omitted at night.

Formula No. 4

THIRD WEEK:

Upper 1½ ounces from each of three quart bottles of milk.
(Use 4 of the 4½ ounces in preparing food.)
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 12 ounces.
Lime water, 4 ounces.
Eight bottles of 2 ounces. Feed every 2½ hours.

Some children require 2½ ounces; therefore the formula for 20 ounces.

Formula No. 5

FOURTH WEEK:

Upper 2 ounces from each of three quart bottles of milk.
(Use 5 of the 6 ounces in preparing food.)
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 11 ounces.
Lime water, 4 ounces.
Eight bottles of 2½ ounces. Feed every 2½ hours.

½ ounce can only be secured with the *keel*-shaped half-ounce dipper of the Noel Nursery Table. Other dippers defeat the purpose of a cream dipper, *i.e.*, feathery proteid flocks.

Dissolve the milk sugar in the cold water; mix the sugar solution and the cream thoroughly together, and *then* add the lime water.

Lime water is added is furtherance of emulsification. As an ally to the motor function of the stomach in its passage of proteid through the constricted pylorus, lime water cannot be substituted for.

Keep the feeding bottles in the refrigerator until used. At the time of feeding, heat the food to a temperature of 98½° to 100° F.

Formula No. 6

FIFTH WEEK:

Upper 2½ ounces from each of three quart bottles of milk.
(Use 6½ of the 7½ ounces in preparing food.)
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 13½ ounces.
Lime water, 4 ounces.
Eight bottles of 3 ounces. Feed every 2½ hours.

Formula No. 7

SIXTH WEEK:

Upper 2½ ounces from each of three quart bottles of milk.
(Use 7 of the 7½ ounces in preparing food.)
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 13 ounces.
Lime water, 4 ounces.
Eight bottles of 3 ounces. Feed every 2½ hours.

Formula No. 8

SEVENTH WEEK:

Upper 2½ ounces from each of three quart bottles of milk.
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 12½ ounces.
Lime water, 4 ounces.
Eight bottles of 3 ounces. Feed every 2½ hours.

When movements are loose, or green, double the lime water; make corresponding diminution of water.

Formula No. 9

EIGHTH WEEK:

Upper 3 ounces from each of three quart bottles of milk.
(Use 8 of the 9 ounces in preparing food.)
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 12 ounces.
Lime water, 4 ounces.
Eight bottles of 3 ounces. Feed every 2½ hours.

Formula No. 10

NINTH AND TENTH WEEKS:

It is now requisite to increase proteid and diminish fat.

Upper 4 ounces from each of two quart bottles of milk.
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 12 ounces.
Lime water, 4 ounces.
Eight bottles of 3 ounces. Feed every 2½ hours.

Formula No. 11

ELEVENTH AND TWELFTH WEEKS:

Upper 5½ ounces from each of two quart bottles of milk.
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 13 ounces.
Lime water, 4 ounces.
Seven bottles of 4 ounces. Feed every 3 hours.

Formula No. 12

THIRTEENTH WEEK:

Upper 6½ ounces from each of two quart bottles of milk.
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 11 ounces.
Lime water, 4 ounces.
Seven bottles of 4 ounces. Feed every 3 hours.

Formula No. 13

FOURTH MONTH:

Upper 7½ ounces from each of two quart bottles of milk.
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 9 ounces.
Lime water, 4 ounces.
Seven bottles of 4 ounces. Feed every 3 hours.

Formula No. 14

FIFTH MONTH:

Upper 8 ounces from each of two quart bottles of milk.
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 11½ ounces.
Lime water, 4 ounces.
Seven bottles of 4½ ounces. Feed every 3 hours.

Formula No. 15

SIXTH MONTH:

Upper 9 ounces from each of two quart bottles of milk.
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 11 ounces.
Lime water, 4 ounces.
Six bottles of 5½ ounces. Feed every 3½ hours.

Necessity for ample minerals and proteid, renders necessary the supplementing of milk in the sixth month. Iron content of milk is seven to fourteen times less than in other articles of food. An infant at birth has a store of iron in the liver provided by mother during intra-uterine existence. This store is drawn upon for blood-coloring matter.—It is sufficient for the milk period. When this store is exhausted, milk must be supple-

mented to avert supervention of anæmia. Higher proteid is likewise requisite. Infant physiology declares vegetable legitimate. Vegetable proteid is necessary from the sixth month. Oatmeal is among the richest in iron of the vegetable foods. Oatmeal is abundant in proteid, fat, and minerals. Proteid 14½ per cent.; fat, 10 per cent.; mineral elements, 2 per cent. Composition establishes pre-eminence of oatmeal for infants.

In summer, barley or granum; in autumn and winter, oatmeal. It must not be added to the bottle until immediately before feeding, as cereal and milk mixed and allowed to stand undergo fermentation,—a noxious pudding. One-half ounce of barley or granum, or one teaspoonful of oatmeal jelly, to each bottle. The oatmeal must be strained.

Formula No. 16

SEVENTH MONTH:

Upper 11 ounces from each of two quart bottles of milk.
Milk sugar, 6 teaspoons level full.
Cold unboiled filtered water, 9 ounces
Lime water, 4 ounces.
Five bottles of 7 ounces. Feed every 4 hours. (Many do not take all: do not urge.

Formula No. 17

EIGHTH AND NINTH MONTHS:

Upper 13 ounces from each of two quart bottles of milk.
Milk sugar, 5 teaspoons level full.
Cold unboiled filtered water, 10 ounces.
Lime water, 4 ounces.
Five bottles of 8 ounces. Feed every 4 hours. Add two teaspoonfuls of strained oatmeal jelly to each bottle.

Formula No. 18

TENTH TO ELEVENTH MONTH:

Upper 18 ounces from each of two quart bottles of milk.
Milk sugar, 4 teaspoons level full.
Cold unboiled filtered water, 10 ounces.
Lime water, 4 ounces.
Five bottles of 10 ounces. Feed every 4 hours. Add one tablespoonful of strained oatmeal jelly to each bottle.

Formula No. 19

TWELFTH MONTH:

Upper 21 ounces from each of two quart bottles of milk.
Milk sugar, 4 teaspoons level full.
Cold unboiled filtered water, 4 ounces.
Lime water, 4 ounces.
Five bottles of 10 ounces. Feed every 4 hours. Add two tablespoonfuls of strained oatmeal jelly to each bottle.

Formulas for Home Modification of Bottled Milk for Feeding During Summer Months

Summer necessitates cautious, gradual strengthening of formulas. Summer formulas should be used for feeble, delicate infants, and for those whose digestion has been impaired by barley, malt-soup, proprietary preparations, pasteurization, and peptogenic milk powder. The weakened digestion renders necessary initiating milk-feeding with a low formula. For a child of three or four months, begin with summer formula No. 4. The *first* bottle for weaning, at any period of lactation, should be of this formula.

Formula No. 1

FIRST WEEK:

Upper ½ ounce from each of two quart bottles of milk at 2 P.M.
Milk sugar, 3⅓ teaspoonfuls.
Filtered water, 9 ounces.
Lime water, 1½ ounces.
Quantity at each feeding: First and second days, ½ ounce, third day, 1 ounce. Ten feedings, at 6, 8, 10, and 12 A.M., 2, 4, 6, 8, and 12 P.M.

Formula No. 2

SECOND WEEK:

Upper ½ ounce from each of three quart bottles of milk at 2 P.M.
Milk sugar, 4 teaspoonfuls.
Filtered water, 11½ ounces.
Lime water, 2 ounces.
Ten bottles of 1½ ounces. Feed every two hours.

Formula No. 3

THIRD WEEK:

Upper 1 ounce from each of three quart bottles of milk at 2 P.M.
(Use 2 of the 3 ounces in preparing food.)
Milk sugar, 4 teaspoonfuls.
Filtered water, 10 ounces.
Lime water, 4 ounces.
Eight bottles of 2 ounces. Feed every 2½ hours.

Formula No. 4

FOURTH WEEK:

Upper 1 ounce from each of three quart bottles of milk at 2 P.M.
Milk sugar, 4 teaspoonfuls.
Filtered water, 13 ounces.
Lime water, 4 ounces.
Eight bottles of 2½ ounces. Feed every 2½ hours.

Formula No. 5

FIFTH WEEK:

Upper 1½ ounces from each of three quart bottles of milk at 2 P.M.
Milk sugar, 4 teaspoonfuls.
Filtered water, 15½ ounces.
Lime water, 4 ounces.
Eight bottles of 3 ounces. Feed every 2½ hours.

Formula No. 6

SIXTH WEEK:

Upper 2 ounces from each of three quart bottles of milk at 2 P.M.
(Use 5 of the 6 ounces in preparing food.)
Milk sugar, 4 teaspoonfuls.
Filtered water, 15 ounces.
Lime water, 4 ounces.
Eight bottles of 3 ounces. Feed every 2½ hours.

Formula No. 7

SEVENTH WEEK:

Upper 2 ounces from each of three quart bottles of milk at 2 P.M.
Milk sugar, 4 teaspoonfuls.
Filtered water, 12 ounces.
Lime water, 6 ounces.
Eight bottles of 3 ounces. Feed every 2½ hours.

Formula No. 8

EIGHTH WEEK:

Upper 2½ ounces from each of three quart bottles of milk at 2 P.M.
(Use 7 of the 7½ ounces in preparing food.)
Milk sugar, 4 teaspoonfuls.
Filtered water, 11 ounces.
Lime water, 6 ounces.
Eight bottles of 3 ounces. Feed every 2½ hours.

Formula No. 9

NINTH WEEK:

Upper 2½ ounces from each of three quart bottles of milk at 2 P.M.
Milk sugar, 4 teaspoonfuls.
Filtered water, 10½ ounces.
Lime water, 6 ounces.
Eight bottles of 3 ounces. Feed every 2½ hours.

Formula No. 10

TENTH WEEK:

Upper 3 ounces from each of three quart bottles of milk at 2 P.M.
(Use 8 of the 9 ounces in preparing food.)
Milk sugar, 4 teaspoonfuls.
Filtered water, 10 ounces.
Lime water, 6 ounces.
Eight bottles of 3 ounces. Feed every 2½ hours.

Formula No. 11

ELEVENTH AND TWELFTH WEEKS:

Upper 3 ounces from each of three quart bottles of milk at 2 P.M.
Milk sugar, 4 teaspoonfuls.
Filtered water, 13 ounces.
Lime water, 6 ounces.
Seven bottles of 4 ounces. Feed every 3 hours. Seven feedings in twenty-four hours.

Formula No. 12

THIRTEENTH WEEK:

Upper 3½ ounces from each of three quart bottles of milk at 2 P.M.
(Use 10 of the 10½ ounces in preparing food.)
Milk sugar, 4 teaspoonfuls.
Filtered water, 12 ounces.
Lime water, 6 ounces.
Seven bottles of 4 ounces. Feed every 3 hours.

Formula No. 13

FOURTH MONTH:

Upper 5 ounces from each of two quart bottles of milk at 2 P.M.
Milk sugar, 4 teaspoonfuls.
Filtered water, 12 ounces.
Lime water, 6 ounces.
Seven bottles of 4 ounces. Feed every 3 hours.

Formula No. 14

FIFTH MONTH:

Upper 6 ounces from each of two quart bottles of milk at 2 P.M.
Milk sugar, 4 teaspoonfuls.
Filtered water, 13½ ounces.
Lime water, 6 ounces.
Seven bottles of 4½ ounces. Feed every 3 hours.

Formula No. 15

SIXTH MONTH:

Upper 6½ ounces from each of two quart bottles of milk at 2 P.M.
Milk sugar, 4 teaspoonfuls.
Filtered water, 14 ounces.
Lime water, 6 ounces.
Six bottles of 5½ ounces. Feed every 3½ hours, six feedings in twenty-four hours.

Formula No. 16

SEVENTH MONTH:

Cereal should not be added in summer before the seventh month. Barley should be used.

Upper 7½ ounces from each of two quart bottles of milk at 2 P.M.
Milk sugar, 3 teaspoonfuls.

Filtered water, 12 ounces.
Lime water, 6 ounces.
Five bottles of 6½ ounces. Feed every 4 hours. Immediately before feeding add ½ ounce of barley gruel to each bottle.

Formula No. 17

EIGHTH MONTH:

Upper 8½ ounces from each of two quart bottles of milk at 2 P.M.
Milk sugar, 3 teaspoonfuls.
Filtered water, 12 ounces.
Lime water, 6 ounces.
Five bottles of 7 ounces. Feed every 4 hours. Immediately before feeding add 1 ounce of barley gruel to each bottle.

Formula No. 18

NINTH MONTH:

Upper 9½ ounces from each of two quart bottles of milk at 2 P.M.
Filtered water, 12½ ounces.
Lime water, 6 ounces.
Five bottles of 7½ ounces. Feed every 4 hours. Immediately before feeding add 1 ounce of barley gruel to each bottle.

Vomiting in Infants: Pyloric Spasm

Causes: Digestion is mechanical and chemical. Not one drop of water is ever absorbed from the stomach. There is the same motor action for water, as for food, to force contact with intestinal absorbents. Frequent contraction induces atony. When impaired mechanical power is confronted by narrow pylorus, vomiting is the necessary consequence. Water between feedings is fraught with vomiting. Never give water between feedings.

Distention and pressure by flatulency, caused by emptiness from insufficient food. Unphysiological feeding: Cereal, and proprietary foods before sixth month engender flatulency.

Tight bands, constricting and interfering with free abdominal and thoracic movement. Malposition. A cramped, distorted position of a young child, will cause the stomach to eject its contents.

Fast nipple, too free flow, and choking. Too small opening in nipple, child becomes fatigued and retches, or becomes irritated and annoyed, which ends in vomiting. Handling, playing with, or merely talking to after feeding. Changing napkin after feeding.

The pernicious practice of stomach-washing and of repeated intestinal irrigation; the recourse to enemas where food should correct bowel action, set up irritability of the stomach and *pyloric spasm*, and as an epiphenomenon, nervous susceptibility, which only the most conservative, gentlest management can allay. Pyloric spasm is erroneously denominated pyloric stenosis.

Management

Food: When acidulated at about 98½° to 100° F., the proteid constituent must form light, feathery flocks, which readily emulsify on stirring.

A nurse whose necessary handling does not induce, but ameliorates, nervous susceptibility. No handling or moving except to change diaper. This is to be done before feeding—never after. No bathing while there is troublesome vomiting. Clothing not to be changed except when very necessary. Feed in crib to obviate changing position after feeding, or if fed on lap, to remain there until next feeding is due. Absolute seclusion in a quiet, moderately darkened room. Nurse to occupy an adjacent room.

Restlessness and nervous irritability in exceptional instances, make demand for bromide; 5 or 10 grains, according to age, of bromide of potassium in one teaspoonful of water, given by rectum once in four or six hours, according to necessity, will allay nervous irritability and vomiting. A large nipple may titillate the palate and cause nausea and retching; use a two-ounce bottle with a small neck and a nipple not larger than a medicine dropper. Feeding with a spoon or with a dropper allays vomiting which sucking induces.

Cold milk may agree when hot (98½° to 100°), does not. This is a matter of the palate. Never give water to a very young infant between feedings.

A thoughtful, observant, gentle nurse, guided by a practical physician, brings the case to a successful issue.

Suitable attention to physical behavior of proteid, with management adapted to individual attributes, would eliminate gastroenterostomy—a mere subterfuge in feeding faults.

Refusal of Food

A bottle-fed child must never be given water from a bottle. Refusal of food ultimately ensues. A nipple with a hole so small as to necessitate strong suction may end in refusal to draw the bottle. This was explained to a mother and nurse, and assurance was given that this condition did not obtain. The child continued to take but one or two ounces. A trained nurse put in charge at once discovered this to be the fault. This corrected, the child took eagerly the entire feeding.

A smeary, water-soaked gum nipple may create distaste for and refusal of food. After the nipples are sterilized by boiling, they should be dried and wrapped in sterilized gauze—never in cotton. A thread of cotton adhering to a nipple, by titillation, may cause refusal to nurse.

Absolute quiet should be maintained during feeding. Conversation, playing of children, talking to, or anything that diverts, will stop some children in the midst of a feeding, and often they will not take the bottle again.

25 West Thirty-seventh Street,
New York.